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INCIDENCE OF SERIOUS MORBIDITY AMONG A GROUP OF WAGE EARNERS.¹

By serious morbidity is meant disability from sickness and non-industrial accidents lasting at least one week. The cases are those for which sick benefits have been paid to members of certain employee sick-benefit associations and company relief departments reporting to the Public Health Service. As pointed out in previous articles,² the rates should probably be regarded as a minimum statement of the disabilities causing absence from work for a week or longer, on account of certain rules of a number of the reporting associations which prevent payment of benefits for disability from venereal disease, from certain chronic diseases contracted prior to the date of joining the association, and from certain other causes of disability. A large proportion of the reporting associations also have age limits for eligibility to membership.

The cases have been tabulated according to the diseases reported as causing disability. While practically all of the reporting associations require a physician's certificate naming the ailment causing disability, errors in diagnosis undoubtedly have occurred. It is believed, however, that the diagnoses are sufficiently correct to afford a fairly good picture of serious morbidity among the large number of working people considered. The International List of the Causes of Sickness and Death has been used in the classification of these data in accordance with the recommendation of the committee on industrial morbidity statistics of the American Public Health Association. In some of the accompanying tables and graphs certain related diseases have been grouped not strictly in accordance with the international classification; but in all such instances statements of the diseases included or excluded appear in the footnotes.

¹ From the Statistical Office, U. S. Public Health Service. Data collected and tabulated under the supervision of Dean K. Brundage.

² The statistics for the first half of 1920, for the first nine months of 1920, for the calendar year 1920, and for the entire period from January 1920 to June 1921 have been discussed in a series of articles entitled "Sickness Frequency Among Industrial Employees," available in the following reprints: (1) Reprint No. 624 from the Public Health Reports of December 3, 1920, pp. 2897-2907; (2) Reprint No. 641 from the Public Health Reports of March 4, 1921, pp. 429-434; (3) Reprint No. 671 from the Public Health Reports of July 1, 1921, pp. 1497-1502; and (4) Reprint No. 721 from the Public Health Reports of January 6, 1922, pp. 2-9.

TABLE I.—*Frequency of specified disease groups by month of onset in 1920 and 1921, among a group of wage earners.*¹

Month of onset.	Number of sick-benefit associations reporting.		Membership.		Number of cases per 1,000 persons per year.													
					All diseases and conditions. ²		General diseases. ³		Diseases of the nervous system. ⁴		Diseases of the circulatory system.		All respiratory diseases. ⁵		Diseases of the digestive system. ⁶		All other diseases and conditions.	
					1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921
January.....	8	29	14, 208	67, 028	275.0	134.0	18.3	17.6	7.5	8.3	2.5	4.7	210.3	58.3	9.1	16.7	29.8	33.1
February.....	13	30	22, 249	68, 820	325.7	152.5	16.4	18.0	8.5	6.8	5.1	5.3	255.8	81.2	10.2	14.6	35.8	31.9
March.....	15	30	25, 527	72, 755	126.0	128.5	14.1	17.7	8.0	5.5	4.5	5.7	71.2	56.0	14.1	16.6	18.6	32.7
April.....	17	31	25, 832	71, 503	103.9	110.6	16.0	14.8	8.0	7.2	3.3	4.4	40.6	45.0	8.6	14.8	30.7	28.8
May.....	22	31	54, 044	70, 555	76.7	88.4	11.3	15.0	5.9	4.8	4.8	5.5	27.8	25.2	9.8	13.4	21.9	30.0
June.....	25	31	58, 036	69, 389	67.3	76.6	13.4	9.0	5.0	8.6	3.0	2.8	17.9	17.9	10.1	16.1	20.9	25.0
July.....	26	22	58, 385	56, 331	67.1	70.6	7.5	9.0	3.8	6.7	4.0	3.5	13.7	15.8	11.6	13.6	30.5	25.5
August.....	25	22	58, 969	55, 577	60.1	87.9	8.8	11.0	4.0	7.8	2.0	3.0	16.4	22.7	12.2	17.8	18.7	23.6
September.....	23	22	60, 264	55, 566	56.2	86.7	6.9	14.2	4.3	6.5	1.8	3.1	16.0	19.9	9.7	19.1	19.3	27.0
October.....	25	22	59, 211	53, 272	76.4	81.6	7.9	9.0	4.8	5.2	3.0	3.4	29.2	30.8	11.7	15.1	22.8	21.5
November.....	27	22	75, 015	56, 928	85.7	94.3	10.0	9.8	5.5	4.1	3.4	4.5	34.2	41.4	12.5	12.5	23.5	25.5
December.....	26	22	67, 197	56, 511	106.1	105.2	14.6	10.1	6.5	7.1	4.7	6.2	49.7	45.7	11.5	13.7	23.8	28.6

¹ Annual number of cases per 1,000 members of certain sick-benefit associations reporting to the Public Health Service. Only those cases of sickness and nonindustrial accidents causing disability for one week or longer are included.

² Except the venereal diseases.

³ Excluding influenza, grippe, and tuberculosis of the lungs.

⁴ Including organs of special sense (eyes, ears).

⁵ Including influenza and grippe, tuberculosis of the lungs, and diseases of the pharynx.

⁶ Except diseases of the pharynx.

Seasonal Variation in Sickness Incidence.

The frequency rates of certain disease groups are presented in Table I according to the month in which disability began, the rate for each month in 1920 being compared with the rate for the corresponding month in 1921. The rates are placed on an annual basis; i. e., the rate for any month represents what the total sickness from any specified cause would have been for the whole year had the rate for that month been maintained throughout the year.

The decrease in membership which occurred after March, 1921, was due largely to reduction in the number of persons employed by companies cooperating and to a decrease of nine in the number of sick-benefit associations reporting. The 1922 figures, however, will show increases both in the number of persons and number of companies reporting.

The seasonal fluctuation in the frequency of all diseases combined was fairly similar in both years except during August and September, when disease incidence decreased in 1920 and increased in 1921. Table I shows that the increases in August and September, 1921, occurred largely in the "general" group, the digestive group, and in "All other diseases and conditions." Table II, which gives the 1921 rates in more detail, reveals an increase during these two months in the frequency of typhoid fever, rheumatism, diseases of the stomach, diarrhea and enteritis, diseases of the skin, and diseases of the bones and of the organs of locomotion. The rate for all diseases combined dropped in October, but increased again in November in accordance with seasonal sickness expectancy.

Throughout 1921 the rates were somewhat higher than the corresponding figures in 1920 except during the influenza epidemic of January-February, 1920. Digestive troubles, especially, were more prevalent throughout 1921 than in 1920, and respiratory illnesses occurred oftener in the last half of 1921 than in the second half of 1920. In the frequency of serious digestive diseases there appears to be little seasonal variation; diseases of the circulatory system, however, exhibit a slight seasonal tendency, a diminished incidence being manifest in the summer and early fall of both years.

TABLE II.—*Number of cases of sickness and nonindustrial accidents causing absence from work for one week or longer per 1,000 persons per year among the membership of certain sick-benefit associations reporting to the Public Health Service, by disease causing disability, according to month of onset in the year 1921.*

Disease or condition causing disability (with corresponding title numbers in parentheses from the International List of the Causes of Sickness and Death).	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
All diseases and conditions ¹	134.0	152.5	128.5	110.6	88.4	76.6	70.6	87.9	86.7	81.6	94.3	105.2
General diseases (1-59).....	40.8	60.2	46.1	34.0	23.7	14.2	14.2	17.8	20.1	21.6	26.9	31.0
Typhoid fever (1).....	.2	.2	.2	.2	.2	.2	.2	.8	1.3	.6	.8	.4
Influenza and gripe (10).....	20.7	40.7	25.6	16.7	6.7	3.3	3.1	4.7	5.2	11.1	15.4	19.0
Tuberculosis of the lungs (28).....	2.5	1.5	2.8	2.5	2.0	1.9	2.1	2.1	.7	1.5	1.7	1.9
Cancer, all forms (39-46).....	.2	.6	.2	1.2	1.0	.4	.2	.2	.7	.2	.2	1.0
Rheumatism (47, 48).....	7.7	8.0	10.2	7.7	6.3	4.2	2.3	4.9	4.6	4.0	4.5	5.8
Occupational poisonings (57, 58).....	.9	.5	.7	.5	.4	.2	.3	.1	.4	.2	.3	.2
Others (2-9, 11-27, 29-38, 49-56, 59).....	9.5	9.5	7.4	5.8	7.5	4.2	6.3	5.1	7.2	4.2	4.3	2.9
Diseases of the nervous system (60-76) ²	8.3	6.8	5.5	7.2	4.8	8.6	6.7	7.8	6.5	5.2	4.1	7.1
Insanity (67, 68).....	.2	.2	.2	.7	.2	.2	.6	.4	.1	.6	.1	.6
Neuralgia and neuritis (73).....	2.6	1.1	2.3	2.0	1.5	2.3	2.1	1.9	1.7	.6	1.3	1.7
Others (60-66, 69, 70, 72, 74).....	3.9	2.8	1.6	2.4	1.7	3.5	3.2	4.0	3.5	3.0	1.5	2.1
Diseases of the eyes (75).....	.9	1.9	.7	1.4	1.0	1.4	.4	.9	1.1	.6	.9	1.5
Diseases of the ears (76).....	.7	.8	.7	.7	.5	1.2	.4	.6	.2	.4	.4	1.2
Diseases of the circulatory system (77-85).....	4.7	5.3	5.7	4.4	5.5	2.8	3.5	3.0	3.1	3.4	4.5	6.2
Diseases of the heart (77-80).....	1.8	1.9	2.6	1.9	2.3	.9	2.1	.4	.7	1.1	1.7	2.7
Diseases of the veins (83).....	2.1	1.7	2.3	2.0	2.7	1.2	1.4	1.9	1.7	1.7	1.3	1.6
Others (81, 84, 85).....	.9	1.7	.8	.5	.5	.7	.1	.7	.7	.6	1.5	1.9
Diseases of the respiratory system (86-98).....	20.7	25.0	17.2	16.9	10.0	7.4	6.7	10.0	11.4	13.8	17.5	17.7
Bronchitis (89, 90).....	7.7	11.4	6.8	5.6	4.2	3.0	1.9	4.7	4.6	7.3	7.5	7.3
Pneumonia, all forms (91, 92).....	4.4	3.6	4.9	3.9	1.5	.5	1.0	.9	1.3	2.1	2.8	3.5
Others (86-88, 93-98).....	8.6	10.0	5.5	7.3	4.3	3.9	3.8	4.4	5.5	4.4	7.2	6.9
Diseases of the digestive system (99-118).....	31.1	28.6	27.0	23.7	19.9	21.4	17.5	23.7	21.7	19.5	20.3	20.8
Diseases of the pharynx (100).....	14.4	14.0	10.4	8.9	6.5	5.3	3.9	5.9	2.6	4.4	6.8	7.1
Diseases of the stomach (102, 103).....	5.5	3.4	4.7	3.4	4.0	5.1	4.2	5.1	5.7	4.8	4.8	3.5
Diarrhea and enteritis (105).....	1.4	1.3	1.9	1.0	1.7	1.9	3.9	4.4	4.2	2.5	1.5	2.9
Appendicitis (108).....	4.0	3.6	4.4	5.1	3.8	3.7	2.5	3.2	5.5	4.4	3.8	4.4
Hernia (109).....	2.6	3.4	2.3	3.6	2.2	3.0	1.5	2.5	1.7	1.5	1.9	.2
Others (99, 101, 106, 107, 110-118).....	3.2	2.8	3.4	1.7	1.7	2.5	1.5	2.6	2.0	1.9	1.5	2.7
Nonvenereal diseases of the genito-urinary system and annexa (119-133).....	3.9	4.0	2.1	4.1	2.8	2.6	2.2	2.3	3.1	3.1	3.6	2.1
Acute nephritis and Bright's disease (119, 120).....	.7	1.0	.3	1.2	1.0	.9	1.0	.6	.5	.4	.6	.4
Others (121-133).....	3.2	3.0	1.8	2.9	1.8	1.8	1.3	1.7	2.6	2.7	3.0	1.7
The puerperal state (134-141).....												
Diseases of the skin and cellular tissue (142-145).....	4.4	4.0	2.9	3.2	3.8	3.2	3.9	4.9	4.4	2.5	3.9	4.0
Furuncle (143).....	1.9	1.3	.5	.5	1.5	.9	1.6	1.3	1.5	.8	2.8	1.9
Others (142, 144, 145).....	2.5	2.7	2.4	2.7	2.3	2.3	2.3	3.6	2.9	1.7	1.1	2.1
Diseases of the bones and of the organs of locomotion (146-149).....	5.8	4.2	7.1	4.6	4.8	5.4	2.7	5.3	4.6	2.9	3.2	4.6
Diseases of the bones and of the joints (146-147).....	.9	1.0	1.8	1.4	1.2	1.8	.4	.8	1.1	.6	.6	.8
Others, including lumbago (148, 149).....	4.9	3.2	5.3	3.2	3.7	3.7	2.3	4.5	3.5	2.3	2.6	3.8
Senility (154).....	.2				.5							
External causes (155-180).....	7.9	8.2	10.0	8.7	9.5	8.4	9.6	9.7	9.8	6.9	9.4	9.8
Ill-defined diseases and conditions (187-189).....	6.5	6.3	4.7	3.4	3.5	2.6	3.5	3.4	2.0	2.7	.9	1.9

¹Except the venereal diseases.

²Including organs of special sense (eyes, ears).

TABLE III.—*Frequency of specified diseases, by month of occurrence in 1920 and 1921, among a group of wage earners.*¹

	Influenza and grippe (10).	Bron- chitis (89, 90).	Pneu- monia (91, 92).	Other respira- tory (86-88, 93-98). ²	Diseases of the pharynx (100).	Rheu- matism (47, 48).
1920.						
January.....	142.9	21.6	15.8	12.5	15.0	6.6
February.....	201.4	19.3	12.5	9.1	12.5	6.8
March.....	37.1	12.0	2.5	6.5	10.0	5.5
April.....	13.2	8.5	4.7	6.1	7.1	8.0
May.....	4.6	6.3	5.0	5.5	5.5	5.0
June.....	2.3	3.2	1.9	4.2	4.0	6.7
July.....	.8	3.8	1.6	2.6	3.4	3.0
August.....	1.2	3.8	2.0	4.4	3.6	3.4
September.....	2.0	4.1	1.6	2.4	4.1	3.6
October.....	7.4	3.8	3.2	4.8	7.0	3.4
November.....	9.3	6.7	2.4	5.7	7.0	4.6
December.....	18.1	6.2	4.9	6.5	11.2	7.0
1921.						
January.....	20.7	7.7	4.4	8.6	14.4	7.7
February.....	40.7	11.4	3.6	10.0	14.0	8.0
March.....	25.6	6.8	4.9	5.5	10.4	10.2
April.....	16.7	5.6	3.9	7.3	8.9	7.7
May.....	6.7	4.2	1.5	4.3	6.5	6.3
June.....	3.3	3.0	.5	3.9	5.3	4.2
July.....	3.1	1.9	1.0	3.8	3.9	2.3
August.....	4.7	4.7	.9	4.4	5.9	4.9
September.....	5.2	4.6	1.3	5.5	2.6	4.6
October.....	11.1	7.3	2.1	4.4	4.4	4.0
November.....	15.4	7.5	2.8	7.2	6.8	4.5
December.....	19.0	7.3	3.5	6.9	7.1	5.8

¹ Annual number of cases per 1,000 members of certain sick-benefit associations reporting to the Public Health Service. Only those cases of sickness and nonindustrial accidents causing disability for one week or longer are included.

² Including colds, laryngitis, pleurisy, pulmonary emphysema, etc., but not including pulmonary tuberculosis nor diseases of the pharynx.

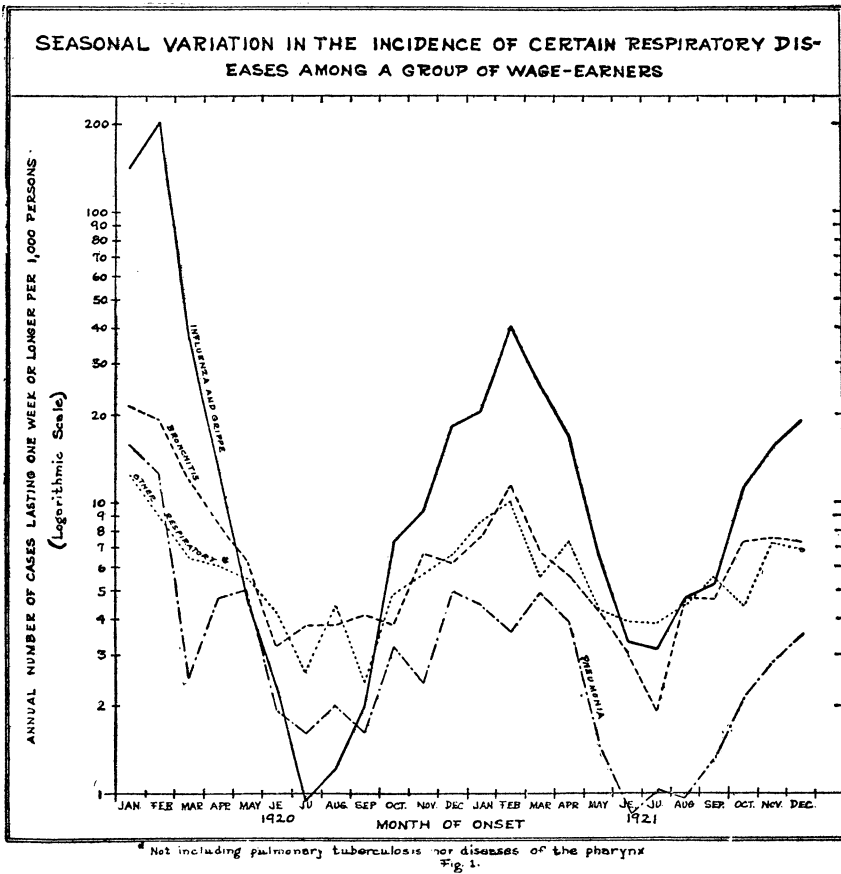
In Figure 1 the incidence of certain respiratory diseases has been plotted on a logarithmic scale to show the relative changes from month to month. The variation is extreme for influenza and grippe, even in the year 1921, which was not marked by an epidemic of influenza. The seasonal frequency of bronchitis appears to be similar to "other respiratory" diseases, which include such ailments as colds, laryngitis, pleurisy, pulmonary emphysema, and other similar respiratory illnesses. In 1921, February had the most, July the least, number of respiratory cases lasting a week or longer among the wage earners in the group under study.

Frequency of Sickness in Different Establishments.

The tables and graphs showing the rates in different plants include only those cases of sickness and nonindustrial accidents which caused disability for eight consecutive days or longer, and are therefore on a slightly different basis from the rates by months, which include all sickness and nonindustrial accidents lasting "a week or longer." The number of persons used as the divisor in the calculation of these rates is the yearly average of the number of employees reported as

holding membership in each association or relief department on or about the 15th of each month.

Attention is called to the wide variation in the rates for different industrial establishments. From the lowest rate (48 cases per 1,000 persons) to the highest (349 cases per 1,000 persons) is a range of more than 700 per cent, and if we exclude establishment No. 1, which



appears to have an unusually high incidence rate, we still have a difference amounting to more than 360 per cent of the lowest rate.

Establishment No. 27, which had the lowest rate, is a steel plant in Ohio. Other steel companies in the group are numbers 8, 10, and 22. Numbers 4, 6, 18, and 19 are large public utility corporations. The rest of the establishments are in various industries.

TABLE IV.—*Number of cases of sickness and nonindustrial accidents causing disability for eight consecutive days or longer per 1,000 persons in the year 1921, by establishments reporting.*

Reporting establishments.	Average number of persons.	Total number of cases.	Number of cases per 1,000 persons.
All reporting establishments.....	75,191	7,356	97.8
Establishment—			
No. 1.....	1,271	443	348.5
No. 2.....	3,290	572	173.9
No. 3.....	307	47	153.1
No. 4.....	4,788	696	145.4
No. 5.....	1,035	149	144.0
No. 6.....	3,037	434	142.9
No. 7.....	715	100	139.9
No. 8.....	2,354	302	128.3
No. 9.....	153	19	124.2
No. 10.....	905	104	114.9
No. 11.....	7,292	836	114.6
No. 12.....	904	103	113.9
No. 13.....	1,155	131	113.4
No. 14.....	990	109	110.1
No. 15.....	474	51	107.6
No. 16.....	544	54	99.3
No. 17.....	4,704	398	84.6
No. 18.....	10,275	864	84.1
No. 19.....	471	36	76.4
No. 20.....	171	13	76.0
No. 21.....	3,508	261	74.4
No. 22.....	12,111	870	71.8
No. 23.....	90	5	55.6
No. 24.....	5,745	319	55.5
No. 25.....	326	18	55.2
No. 26.....	1,620	89	54.9
No. 27.....	6,956	333	47.9

TABLE V.—*Frequency of serious morbidity among males in establishment No. 1 compared with the average for males in 25 other plants, year 1921.¹*

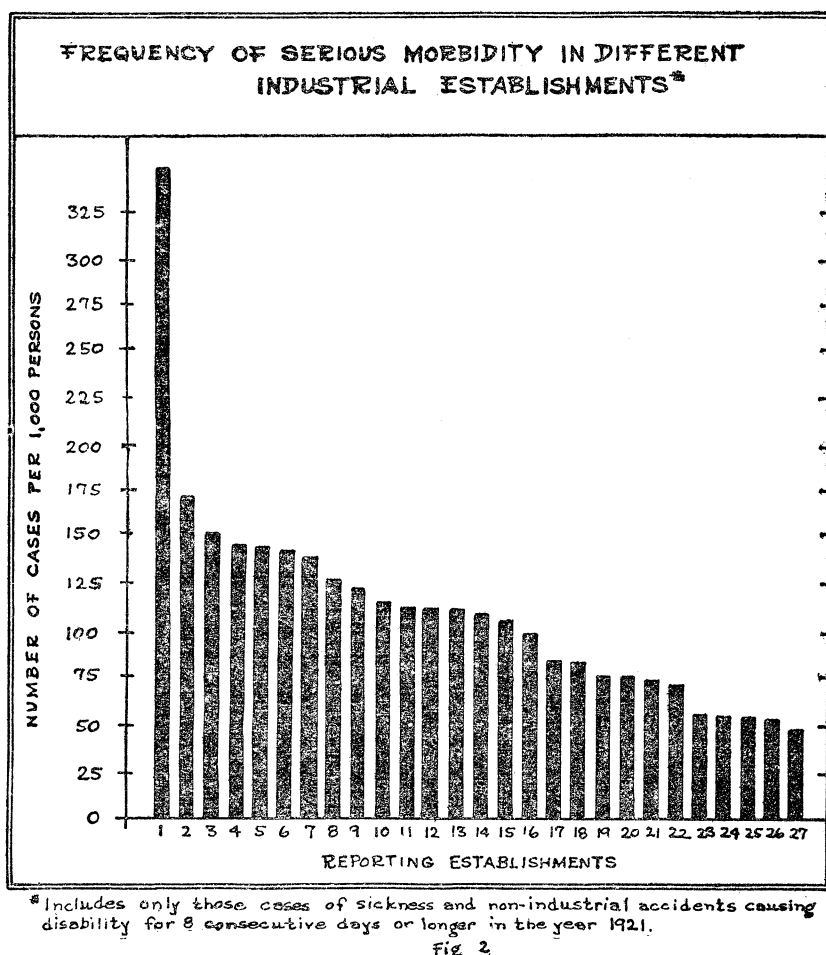
Diseases and conditions causing disability (with corresponding title numbers in parentheses from the International List of the Causes of Sickness and Death).	Males.				
	Number of cases.		Number of cases per 1,000.		Per cent above (+) or below (—) the average for 25 other companies.
	Establishment No. 1.	25 other companies.	Establishment No. 1.	25 other companies.	
All diseases and conditions (1-189).....	414	5,590	443.7	85.8	+417
Epidemic diseases in the "general" group (1, 5-9, 19) ²	8	164	8.6	2.5	+244
Purulent infection (20).....	4	154	4.3	2.4	+79
Rheumatism, neuralgia, neuritis, and lumbago (47, 48, 73, 149).....	62	615	66.4	9.4	+606
Tonsillitis and other diseases of the pharynx (100).....	25	362	26.8	5.5	+387
Influenza and grippe (10).....	120	734	128.6	11.3	+1,038
Other respiratory diseases including tuberculosis of the lungs (28, 86-98) ³	60	950	64.3	14.6	+340
Diseases of the digestive system (99-118).....	51	870	54.7	13.4	+308
Diseases of the circulatory system (77-85).....	14	257	15.0	3.9	+285
Diseases of the skin and cellular tissue (142-145).....	16	220	17.1	3.4	+403
All other diseases and conditions.....	54	1,264	57.9	19.4	+198
Average number of males.....	933	65,161			

¹ The record applies only to cases of sickness and nonindustrial accidents causing disability for eight consecutive days or longer.

² Typhoid fever, smallpox, measles, scarlet fever, whooping cough, diphtheria and croup, mumps, German measles, and chicken pox.

³ Except tonsillitis and other diseases of the pharynx.

The rates shown in Table IV and Figure 2 are for the plant as a whole regardless of the sex composition of the membership. A tabulation of the data at hand according to sex revealed a sickness frequency rate for females nearly 50 per cent greater than the male rate; so a certain amount of variation is to be expected when the proportion of women employed varies in different establishments. In Tables V and VI the sex factor was eliminated by considering



only the males. Contrary to expectation, the females in establishment No. 1 experienced a lower sickness rate than the males, for the number of cases was 444 per 1,000 males as compared with 349 cases per 1,000 persons of both sexes. An amazing amount of excess disability as measured by the experience for 25 other companies is shown in the final column of Table V, especially for influenza and grippe, for rheumatism, neuralgia, neuritis, and lumbago, and for diseases of

the skin and cellular tissue. In contrast, the rates for these diseases in establishment No. 27 as shown in Table VI were markedly below the average of the 25 other companies.

Such wide differences in the frequency of disease suggest to the industrial physician that great opportunities exist for reducing disability rates in many industrial establishments to the very low frequency that is maintained in certain plants like No. 27. It is important to point out, however, that before the problem can be intelligently attacked, we must ascertain in as much detail as possible the causes of the widely different sickness rates of certain industrial establishments.

TABLE VI.—*Frequency of serious morbidity among males in establishment No. 27 compared with the average for males in 25 other plants, year 1921.*¹

Diseases and conditions causing disability (with corresponding title numbers in parentheses from the International List of the Causes of Sickness and Death).	Males.				
	Number of cases.		Number of cases per 1,000.		Per cent above (+) or below (—) the average for 25 other com- panies.
	Estab- lishment No. 27.	25 other com- panies.	Estab- lishment No. 27.	25 other com- panies.	
All diseases and conditions (1-189).....	327	5,677	47.4	95.9	—51
Epidemic diseases in the "general" group (1, 5-9, 19). ²	15	157	2.2	2.7	—19
Purulent infection (20).....	15	143	2.2	2.4	—8
Rheumatism, neuralgia, neuritis, and lumbago (47, 48, 73, 149).....	30	647	4.3	10.9	—61
Tonsillitis and other diseases of the pharynx (100).....	27	360	3.9	6.1	—36
Influenza and grippe (10).....	30	824	4.3	13.9	—69
Other respiratory diseases including tuberculosis of the lungs (28, 86-98). ²	58	952	8.4	16.1	—48
Diseases of the digestive system (99-118).....	70	851	10.1	14.4	—30
Diseases of the circulatory system (77-85).....	26	245	3.8	4.1	—7
Diseases of the skin and cellular tissue (142-145).....	8	228	1.2	3.9	—69
All other diseases and conditions.....	48	1,270	7.0	21.4	—67
Average number of males.....	6,900	59,184			

¹ The record applies only to cases of sickness and nonindustrial accidents causing disability for eight consecutive days or longer.

² Typhoid fever, smallpox, measles, scarlet fever, whooping cough, diphtheria and croup, mumps, German measles, and chicken pox.

³ Except tonsillitis and other diseases of the pharynx.

INFLUENZA IN THE UNITED STATES.

The following table shows the number of cases of influenza reported by telegraph by State health officers to the United States Public Health Service for the period from October 1 to December 23, 1922, compared with similar reports during the corresponding period of the years 1921 and 1920.